Metropolitan Transportation Authority

Capital Needs Assessment 2000-2019

Table of Contents

Introduction

The economy of the New York Metropolitan Region is growing and becoming increasingly global. Employment in the MTA Service Region has grown by 3 percent since 1990[1]. Much of the region's employment (25 percent) continues to be centered in Manhattan[2]. As the economy has grown, regional travel has also been on the rise. MTA system ridership (New York City Transit, Metro-North, the Long Island Rail Road and Long Island Bus) has increased 21 percent since 1990[3].

Regional growth is expected to be significant over the next twenty years. For example, regional population is projected to increase by 11 percent in the next twenty years[4], while Manhattan employment is projected to grow by 14 percent[5], and on average, work travel to Manhattan is projected to grow by 13 percent[6] from different parts of the MTA service region.

To achieve the full potential of this continued economic growth, the MTA, as the region's primary transportation agency, needs to address two key investment issues affecting its ability to provide the transit services needed for the region:

- First and foremost, the MTA's vast physical plant must be maintained and repaired on an ongoing basis to ensure the continued reliability of current services. For the past twenty years, including this recent period of regional growth, the MTA has concentrated its capital resources on returning the transit system from a "State of Emergency" in the early 1980's to a state-of-good-repair allowing a larger share of continuing capital investments to focus on normal replacement life-cycles.

As a result of this massive effort, the MTA has already returned many critical assets, such as its subway cars, buses, and mainline tracks and switches, to a state-of-good-repair and is making progress in other key areas such as signals, yards, stations and bus depots.

However, some elements of the transit network's infrastructure remain in deteriorated condition due to deferred maintenance in the 1970's, and must be repaired. The next 20 years will be a period when the majority of the remainder of the system's infrastructure is returned to a state-of-good-repair.

- Secondly, it is more clear than ever that the current rail network needs to be modified and expanded to meet the needs of an ever-growing New York region.

  The configuration of the region's rail network, so critical to supporting and facilitating the current economic expansion, has not been significantly enhanced since its inception in the first half of the 20th century, despite the region's current and forecasted growth. The region must provide links between labor force and employment centers, especially those concentrated in the region's core, Manhattan.

To guide the development of the capital strategies needed to address these issues, MTA has prepared an assessment of capital needs for the twenty year period from 2000 to 2019. This period begins with, and is the basis for, the next MTA five-year Capital Program proposed for the years 2000-2004. The program is the fifth in a series to continue the rebuilding of the region's mass transportation network, and will

also address improving that network to achieve even greater reliability and enhanced service levels.

Twenty-Year Capital Needs Assessment

During 1998 and 1999, MTA agencies performed an assessment of capital needs for the twenty year period covering 2000-2019. These assessments are periodically prepared to set the long-term context for all MTA five-year plans.

The assessment process starts with an update of the inventory and condition status for all the agencies' capital assets. These activities include physical examinations, a review of past capital investments, maintenance and repair records and the need for technological upgrades. Projects are selected based on intensity of need, scheduling concerns and asset-specific investment strategies which define the integrated operating objectives for groups of assets. These projects are focused on both rebuilding the existing system, maintaining the components already repaired, and making the existing system work more efficiently (termed "continuing needs").

These investments – especially those that improve service within the existing network, also reflect the MTA Strategic Business Plan, whose assumptions about future operations and service plans translate into specific capital projects.

This assessment also includes the MTA's ambitious plan for expansion of its transportation system ("network expansion"), guided by Master Links, Governor Pataki's vision to better integrate and expand the rail network.

Continuing Needs

Investments supporting "continuing needs" are primarily focused on the existing physical network and include three elements: completing the repairs to infrastructure components still to be renewed; maintaining the extensive inventory of equipment and infrastructure which was repaired in previous capital programs; and making improvements to existing infrastructure to make the transit system work more efficiently and provide greater benefits to the riding public.

- **Restore the Network to a State-of-Good-Repair (SGR)**

  For the past twenty years, the MTA has concentrated its capital resources on returning the transit system from a "State of Emergency" in the early 1980's to a state-of-good-repair (SGR) and a cycle of normal replacement (NR) of infrastructure. Nevertheless, substantial portions (such as stations and less visible infrastructure) remain to be done, and this rebuilding continues to be MTA's top priority. The next twenty-year period will see this effort largely completed.

- **Ensure that Cyclical Maintenance and Replacement Needs are Met (NR)**

  Through capital investments to date, the agencies have restored subway, bus and commuter rail fleets and certain critical infrastructure areas to a state-of-good-repair. The MTA is committed to preventing these elements of the system from

slipping back into disrepair. "Normal Replacement (NR)" investments are targeted to protect those assets.

- **Improve the Customer Environment and Operating Services (SI)**

  Investments are planned that will enhance the attractiveness of the existing public transportation network, termed "System Improvements (SI)", by relieving overcrowding, providing more reliable and faster service, speeding up fare collection, improving access, and providing better passenger communications.

Network Expansion

In the past 20 years, despite increases in transit ridership, only 4 new route miles (a 1.7 percent increase) have been added to the subway system, including the 63rd Street tunnel between Manhattan and Long Island City, Queens, and the Archer Ave subway line segment in Jamaica, Queens). No new commuter rail links have been added.

This capital needs assessment, and the related 2000-2004 Capital Program addresses this problem by proposing the first significant expansion of the regional rail system since the 1960's. New routes are proposed that will address unmet transportation needs and position the MTA and the region for future growth. The projects will improve the region's mobility and in turn contribute to the region's economic vitality, improve air-quality and save energy.

Continuing Needs

Introduction

In aggregate, the MTA will need to invest $57 billion (constant dollars) over the next 20 years to bring still overage assets to a state-of-good-repair and ensure that assets on normal replacement cycles stay that way (Table 1). While most of the MTA's proposed investments over the next 20 years are devoted to the ongoing cyclical replacement of assets, there is a significant allocation for the continued effort to replace overage assets mostly at New York City Transit. The proposal also contains substantial funding for projects that will improve the current network in order to achieve greater reliability and enhanced service levels.

Table 1
MTA Summary of Continuing Needs: 2000-2019
(1999$ in millions)

Agency	SGR	NR	SI	Total
NYC Transit	$15,766	$21,554	$5,157	$42,477
Long Island Rail Road	145	5,908	1,452	7,505
Metro-North Railroad	1,170	4,194	1,340	6,704
Total	$17,081	$31,656	$7,949	$56,686

In 1982, the first of the successive five-year capital programs was launched in response to a near-complete breakdown of the New York City regional public mass transit. The first ten years were devoted to implementing a sustained program of rescue and recovery of the transportation system. Investments were necessarily focused on the restoration of the existing network, enabling the MTA agencies to

make major strides toward bringing all or substantial portions of their assets to a state-of-good-repair. Increasingly, it has become the standard practice to replace component systems according to useful-life cycles rather than when they are failing.

By the end of 1999, the MTA committed almost $33 billion to repairing, maintaining and improving its massive public transportation network – one of the largest sustained capital improvement campaigns in the nation. The results of this effort are evidenced in the following:

New York City Transit

- **By 1991, the entire 6,000-subway car fleet was restored to good condition** by replacing graffiti-covered, hot and unreliable trains with either brand new or completely rebuilt cars. Cars are now replaced on a regular schedule and additional cars are being bought to accommodate ridership growth. As a result of this investment, the average distance between breakdowns has grown from 7,000 miles per car in 1982 to over 87,000 miles per car today.

- **By 1986, the entire bus fleet was replaced by new or rebuilt buses.** Fleet quality is now ensured through end-of-life replacements. Starting in 1995, a significant expansion in fleet capacity to accommodate ridership growth has been implemented through the capital program. The carrying capacity of the fleet has increased by almost 800 buses.

- **By 1999**, **one-third of all subway stations had been rebuilt or are undergoing rehabilitation.** Especially noteworthy is the work finished or underway at all the transit flagship stations (Herald Square, Main Street/Flushing, Times Square, Union Square, Atlantic Terminal and Grand Central).

- **The 63rd Street Tunnel-Queens Blvd. line connector project is near completion**, which will finally alleviate the overcrowding for Queens subway customers.

Long Island Rail Road

Over the last 18 years, the infrastructure supporting LIRR service was rebuilt and many significant improvements to its network were added:

- **During the 1980's, 174 new electric cars were added** to provide more service to LIRR customers. In the 1995-1999 capital program, the LIRR's aging diesel fleet was completely replaced with new equipment, including dual mode locomotives to provide one-seat rides into Penn Station from diesel territory. In addition, in the 1995-1999 program, 226 new electric cars were purchased to begin the ongoing replacement of the 742 M-1 electric car fleet.

- **Travel times on the Ronkonkoma Branch were reduced for thousands of customers** as a result of the electrification of the mainline from Hicksville to Ronkonkoma. Service capacity and reliability was greatly improved as a result of

reconfiguring the Harold Interlocking and resignaling the Main Line from Penn Station to Jamaica.

- **The massive Penn Station complex was completely rebuilt, reconfigured and expanded** to provide for much better passenger flow and customer amenities. The Woodside, Ronkonkoma, Forrest Hills and Huntington stations were also completely rebuilt and high-level platforms were installed throughout the diesel territory to accommodate the new diesel fleet.

- **The West Side storage yard at Penn Station was completed making it possible to run more trains into the terminal.** A brand-new maintenance facility at Hillside was completed to accommodate fleet growth and improve fleet maintenance.

- **The entire Atlantic Avenue and Montauk branch viaducts were rehabilitated** improving passenger safety and the reliability of train service. And, the dangerous Herricks road grade crossing in Mineola has been completely separated in a joint project with NYSDOT.

Metro-North Railroad

- **West of Hudson River passengers will gain quicker access to Manhattan** through the new Secaucus Transfer facility, which provides direct access to Penn Station.

- **Almost 400 new electric cars and diesel coaches have been purchased** over the last 18 years to both replace overage equipment and provide for the steady ridership growth that Metro-North secured, in large part with its steadily improving service.

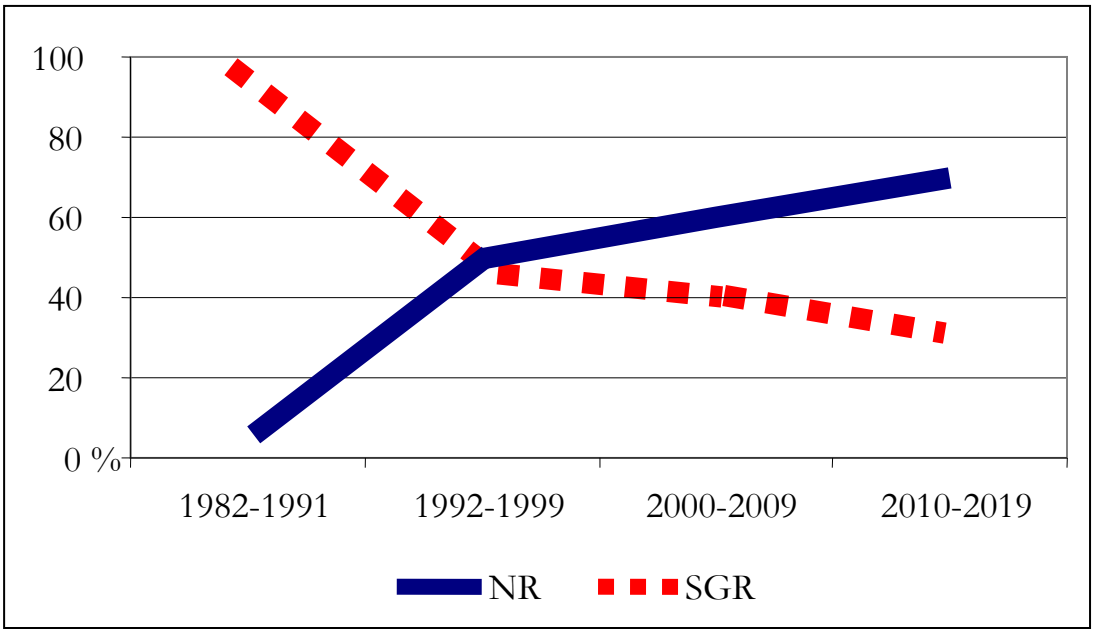
- **Passengers on the Upper Harlem Line are enjoying faster service** resulting from new electrification from North White Plains to Brewster.

- **Commuter parking has been significantly expanded** throughout the Metro-North network, helping to support the railroad's significant ridership growth.

- **The complete revitalization of Grand Central Terminal** has restored this landmark to its full glory and while adding attractive new restaurants and shops. And, access to Grand Central from areas north of 45th has been provided saving travel time for the many commuters with destinations north of the terminal.

Given the MTA's success in rebuilding the network as described above, the nature of its capital investments will be shifting as we move into the future. As Chart 1 shows, over the next 20 years, state-of-good-repair investments will largely disappear and will be replaced by the ongoing cyclical replacement of capital plant and equipment. The reduction of the backlog of deteriorated infrastructure will, in turn, allow the MTA to focus more investments on improving and expanding its system.

Chart 1
Historic and Projected Relative Investment Levels in NR and SGR



New York City Transit Capital Needs 2000-2019

NYC Transit's capital investments between 1982 and 1999 have rescued the system from the brink of collapse, restoring the basic components of the operation to a safe and effective condition. The rail and bus fleets now operate with unprecedented levels of reliability and track and switches are now fully repaired and maintained with well-planned replacement programs. Investments to date focused mainly on restoration of these critical assets and made great progress toward restoring many other assets of the system as well. With safety and reliability of the system safeguarded by investments to date, future investments will focus on replacing over-age assets, improving customer amenities such as subway stations, modernizing systems, and positioning NYC Transit to attract and sustain future growth with efficiency and reliability.

The challenge for the next twenty years is to bring the entire system to a state-of-good-repair, to continue normal replacement investments that protect previous capital investments and maintain system reliability, and to strategically improve the system. NYC Transit forecasts investments exceeding $42 billion through 2019 (Table 2), excluding major subway line extension projects, which are addressed in the second section of this report. More than half ($22 billion) of all needs focus on four major asset groups: new subway cars and buses, station improvements through rehabilitations and related work, and new and upgraded signal and communications systems to improve operations and passenger communication.

Table 2
New York City Transit Summary of Needs 2000-2019
(1999$ in millions)

Investment Category	2000-04	2005-09	2010-14	2015-19	Total
Rail Cars	$1,942	$2,096	$2,114	$20	$6,172
Buses	414	403	752	543	2,112
Passenger Stations	2,267	2,017	2,013	1,774	8,071
Track	815	842	859	877	3,393
Line Equipment	1,103	1,120	1,125	1,063	4,410
Line Structures	752	528	487	487	2,254
Signals & Communications	1,606	1,092	1,227	1,529	5,454
Power	788	840	609	505	2,741
Shops & Yards	949	1,345	904	595	3,793
Depots	386	904	192	212	1,695
Service Vehicles, Security, SIR	220	112	227	146	705
Miscellaneous	439	407	407	423	1,676
Total	**$11,680**	**$11,707**	**$10,915**	**$8,174**	**$42,477**

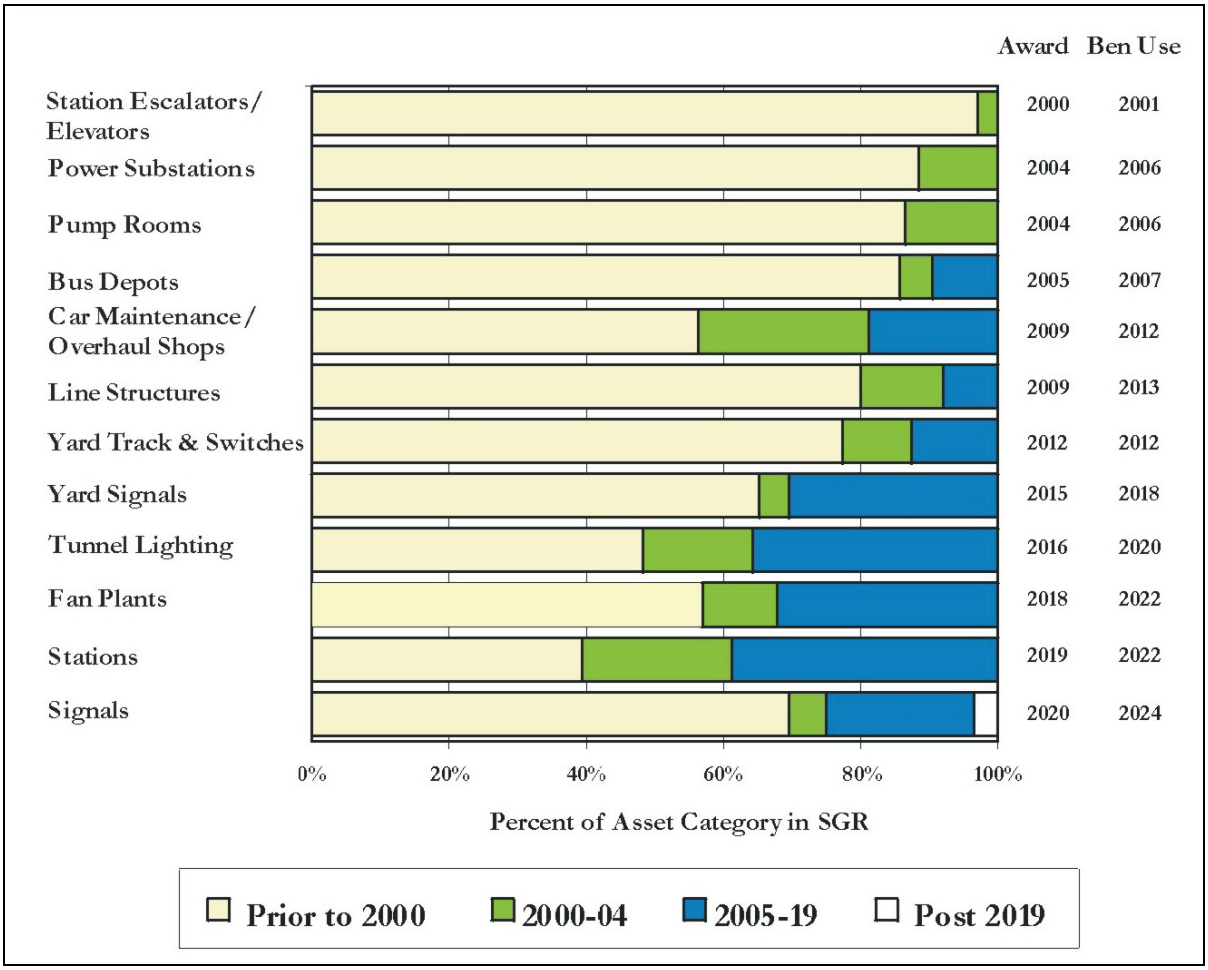
Nearly 20 percent of all NYC Transit's needs are for rolling stock. Investments in subway and bus fleets focus mainly on replacing older vehicles. In the process, new technologies and amenities will be introduced to further improve the quality of service for customers. The agency anticipates increased demand for rail and bus service, and so the fleets will grow in size and in capacity to meet these anticipated needs.

Another 19 percent of total needs relate to improvements in NYC Transit's passenger stations. The pace of annual investment to bring stations to a state-of-good-repair is increasing from the level of previous capital programs. This will allow the award of all remaining station rehabilitations by 2019. The accelerated pace is possible because of innovative project management approaches, such as "line" strategies, and because the agency is moving to rehabilitate a greater number of less complicated stations in the outer boroughs.

Signal investments to date have focused mainly on replacing existing fixed-block systems in-kind, bringing 92 percent of IRT signals and 58 percent of IND/BMT signals into a state-of-good-repair. Signals and communications systems account for approximately 13 percent of all needs. In the next twenty years, new technologies now being introduced will be deployed throughout the system. Because of investments in signals, customers in 2019 will be able to plan their journeys more efficiently and ride with confidence on a transit system radically different from today's system. NYCT will be able to locate, identify and control trains from a central location. Customers at stations will receive real-time information about train arrivals and the status of service. And, train service will be more frequent as new signals regulate train movements more efficiently and safely allow shorter distances between trains.

Substantial capital investment is required both to restore and to maintain the transit network (Chart 2). The level of investment needed over the next twenty years will award work to bring all but two asset categories, fan plants and signals, to a state-of-good-repair. In recent years, these two areas have been the focus of in-depth study and strategic development, as noted in the highlights below, and investments will bring them to a state-of-good-repair shortly after the twenty-year period.

Chart 2
Progress to State-of-Good-Repair for Remaining NYC Transit Investment Categories



Asset Category Summaries

- **Rail Cars**

NYC Transit's revenue fleet of 6,003 subway cars has 2,558 cars in the IRT A division and 3,445 cars in the IND/BMT B division, including 212 ordered in 1998 and 1999 to expand the B division. The entire fleet reached a state-of-good-repair in 1992 with investments from the 1982-1991 capital program.

NYC Transit's fleet strategy for the next 20 years focuses on continuing the normal replacement of cars as they reach the end of their useful lives (typically 35-40 years) and selectively expanding the fleet to support growth. Substantial reinvestment in the fleet is critical over the next 15 years to maintain reliability as various car classes reach retirement age. New car purchases will introduce modern car features and technology that will improve performance, maintenance, and passenger comfort and convenience. Many of these advanced features were developed through NYC Transit's new technology test train program, which was implemented in prior capital programs.

The acquisition of 320 cars in the 2000-2004 period to replace the last *Redbird* cars is the only normal replacement purchase required in the 20-year period for the A division. However, approximately 2,600 cars for the B division will be replaced during the twenty-year period. The rail car fleet will expand by nearly 500 cars over the period to accommodate projected ridership increases. This excludes cars associated with new route proposals discussed elsewhere in the assessment.

- **Bus Fleet**

NYC Transit's bus fleet reached a state-of-good-repair in 1986. By the end of 1999, the total fleet of 4,283 buses includes 3,549 standard buses, 170 articulated buses and 564 express buses. The fleet is 100 percent air-conditioned and wheelchair lift equipped.

For decades, NYC Transit operated only standard 40-foot buses, which continue to be the backbone of the fleet. In 1993, the agency developed a bus fleet strategy calling for the introduction of other sizes and types of buses to accommodate different services and began to implement it in the 1995-1999 Capital Program. One objective of this strategy is to increase service capacity by purchasing larger buses, including 60-foot articulated buses (seating 62 passengers) and 45 foot express buses (seating 57 passengers). The replacement of standard-size buses, which seat 40 passengers, with these larger vehicles gives NYCT the ability to carry more passengers. Adjusting for the larger buses in the fleet, the current diverse fleet of 4,283 buses has the same carrying capacity as 4,468 standard buses.

NYC Transit's bus fleet grew substantially during the 1995-1999 period to accommodate ridership increases. The agency will continue to diversify the fleet from exclusive use of standard size buses by introducing additional articulated and high capacity express buses to support specific services. About 5,600 buses will be purchased over the 20-year period. The fleet is projected to grow, especially in terms of capacity due to the use of larger buses. The carrying capacity of the fleet is anticipated to increase from approximately 4,500 standard buses to approximately 5,000 standard buses.

NYC Transit is committed to reducing harmful bus emissions by expanding the use of existing clean fuel technologies such as compressed natural gas buses and by introducing new technologies, such as hybrid-electric vehicles. Beginning with the 2000-2004 period, for example, all standard buses purchased in the future will use clean fuel technology. Further, NYC Transit will continue to work to develop bus applications for new clean fuel technologies including such "zero emission" propulsion systems as fuel cells.

- **Passenger Stations**

New York City Transit's 468 passenger stations are used by four million riders each day. The system has 277 underground stations, 154 on elevated structures, and 37 on open cut, at-grade or embankment structures. These stations contain 172 passenger escalators and 96 passenger elevators. Most stations reached their current basic configuration before 1940. With the capital investments through 1999, approximately one-third of all stations have been or are being rehabilitated.

Based on an expected 35-year useful life of a station rehabilitation, NYC Transit's 20-year strategy calls for awarding all rehabilitations by 2019 to bring stations to a state-of-good-repair. This requires approximately 16 rehabilitations per year over the next 20 years. Normal replacement work will begin in 2020 for stations that have reached the end of their useful lives. In addition, investments in station structural elements and other station components will be made as needed. NYC Transit will provide full accessibility at 100 stations by 2020, with two-thirds of

them becoming compliant by 2010. Escalators will reach a state-of-good-repair with investments very early in the 20-year period.

NYC Transit will add new features to the station environment by building new intermodal facilities and passenger transfers. These system improvements will enhance access between NYC Transit services and attractiveness for customers. For example, a new transfer between the uptown Bleecker St. station on the Lexington line and the Broadway-Lafayette St. station on the 6th Avenue line will be added. Currently, customers can only transfer between the Broadway-Lafayette St. station and the downtown Bleecker St. station.

- **Track**

NYC Transit's track system consists of approximately 628 miles of mainline track and 1,620 mainline switches. Since track is the cornerstone of reliable service, the agency has given high priority to restoring it to a state-of-good-repair, which was reached for mainline track in 1991 and for mainline switches in 1997. To maintain that condition, NYC Transit has an annual program of normal replacement for each area. The rate of investment in this program largely depends on track type and track geometry. For example, the useful life of track is significantly lower for steeply graded or sharply curved sections of track than for tangent track.

NYC Transit's long-term strategy calls for an annual replacement of approximately eight miles of mainline track in the 2000-2004 period. As more track reaches the end of its useful life, the pace of investment after 2004 is expected to rise to an average of 10.3 miles of track replacement annually until 2019. A larger share of

future track reconstruction will occur on the IND lines where the concrete track invert that was part of the original construction has begun to reach the end of its useful life. For mainline switches, the average useful life varies according to use and configuration.

Operations of the system and service to customers will be enhanced with system improvement work, such as new crossovers or track connections. This give NYC Transit greater operational flexibility when responding to emergencies or other outages so that service can continue with minimum disruption.

- **Line Equipment**

The transit system contains a multitude of electrical and mechanical equipment along the right-of-way including tunnel lighting, ventilation (fan) plants, pumps and power distribution equipment. The system has 417 track miles of tunnel lighting with 48 percent of it in a state-of-good-repair. Future lighting projects will provide higher ambient light levels and greater efficiency with more advanced bulbs. All tunnel lighting will reach a state-of-good-repair by 2016.

There are 202 ventilation plants designed to mitigate the effect of smoke conditions in tunnels during emergencies. Approximately 57 percent of them are in a state-of-good-repair. Extensive research on the ventilation system, including an ongoing fire-life safety and risk assessment study, will influence the selection and priorities for replacing existing fan plants and for construction of new fan plants.

Transit maintains 289 pump rooms located at low points throughout the subway system. The pumps remove water that collects in the tunnels from storm run-off, groundwater infiltration and water main breaks. Eighty-six percent of pump rooms are in a state-of-good-repair; all pump facilities are expected to be in a state-of-good-repair by 2004.

Other line equipment include 34 deep wells, which will reach a state-of-good-repair early in the twenty-year period, and 318 circuit breaker houses, of which approximately 81 percent are in a state-of-good-repair; all are expected to reach state-of-good-repair by 2016. Circuit breaker houses are repaired independently or in conjunction with substation and positive-negative cable projects.

- **Line Structures**

NYC Transit maintains 227 route miles of line structures throughout New York City. These include 136 miles of subway structures (including 13 underwater crossings), 70 miles of elevated structures and 21 miles of at-grade or open-cut structures. Approximately 80 percent of the structures are in a state-of-good-repair. State-of-good-repair will be reached for all line structures by 2009 with the elimination of the backlog of all known deficiencies. Normal replacement investments will commence afterward.

Rehabilitation of elevated structures entails replacing principal elements such as longitudinal girders or stringers that run parallel to the track, cross girders and thru-spans, vertical columns, column bases and connections between these components to provide the necessary flexibility to handle stresses. For subway

structures, water infiltration and soil erosion are the main causes of damage. Repairs involve grouting, plugging leaks, replacing damaged structural elements, particularly the track invert, and replacing spalling concrete.

- **Signals and Communications**

NYC Transit operates a fixed-block, electro-mechanical signal system to regulate movement of subway trains along 724 miles of tracks, interlockings and crossovers. Because of capital investments made to date, 92 percent of IRT signals and 58 percent of IND/BMT signals are in a state-of-good-repair. This has yielded substantial efficiencies, such as consolidating more than 200 local signal towers into 24 master towers. The system operates safely, but much of it is beyond its useful life and all of it is limited by the constraints of fixed-block technology. NYC Transit will continue the strategic systematic shift from fixed-block signals to communication-based train control (CBTC). NYC Transit will upgrade the lines that do not yet have CBTC with automatic train supervision (ATS). All lines with CBTC and ATS systems will be controlled by the rail control center. CBTC improves train throughput and line capacity. ATS improves service through centralized computer-assisted train dispatching and routing and provides real-time train arrival information to customers in stations. The ATS function is included in CBTC systems, but can installed as an overlay to fixed blocked systems.

Over the next twenty years, NYC Transit will begin installing CBTC improvements starting with the Canarsie (now in progress) and Flushing lines. CBTC will then be installed throughout the system mainly on IND lines, but also

on prioritized IRT and BMT lines that would benefit from increased throughput. NYC Transit currently is installing ATS on the IRT lines and will extend it to the BMT/IND lines that have recently installed fixed block signals. By the end of the twenty-year period, CBTC will be installed on more than one-third of all subway lines, and all lines will have ATS capability.

Many vital operations, such as telephone and computer networks, public address systems, police radio systems, and control of power systems and line equipment on the right-of-way, rely on NYC Transit's communications system. The network includes more than 470 miles of fiber optic cable with 87 access nodes, eight telephone switches, copper cable, and several wireless systems supporting approximately 7,400 radios.

Advances in telecommunications technology have enabled NYC Transit to develop a long-term communications strategy that will have far-reaching benefits to operating personnel and customers. The strategy's cornerstone is the expansion of NYC Transit's fiber optic network, which was installed under earlier capital programs for the primary purpose of serving the traction power control system. By connecting the network with stations and facilities, the agency will be able to more reliably and effectively deliver current and future services that require high-speed voice, data and video transmission infrastructure. The expanded data network will be connected with the rail control center and various equipment throughout the system, such as public address/customer information screens and closed circuit television systems in stations. These investments will provide NYC Transit and customers with centralized, real-time train information as well as support safety, train control, and internal NYC Transit information systems.

- **Power**

NYC Transit operates 215 power substations, which are the main elements of its power system. Each contains one or more power rectifiers that convert alternating current to direct current 600-volt for rail operations. There are 106 substations on the IRT/BMT division and 109 on the IND division. The power system includes other equipment such as high-tension feeder and distribution cables, circuit breakers, and switches. There are also emergency alarms throughout the system that permit power to be turned off in local sections of track. All aspects of the power system are controlled from a central location.

In place since 1962, NYC Transit's long-term strategy to modernize and standardize its traction power facilities is nearly complete. Ninety-six percent of IRT/BMT substations and 82 percent of IND substations are now in a state-of-good-repair. All power substations are projected to reach a state-of-good-repair by 2004; normal replacement investment of substation enclosures and equipment will follow. NYC Transit continues to monitor and improve the efficiency of the traction power system by analyzing the power requirements on each track section using a model developed in the agency's 1995 traction power study. This will guide decisions regarding potential additional substations.

- **Shops and Yards**

NYC Transit operates an extensive system of maintenance and repair shops to service subway rolling stock. The agency also has 20 specialty shops that perform

work ranging from track panel fabrication and ironwork to signal training and maintenance. Eight of the 14 maintenance shops, one of the 2 overhaul shops and 12 of the 20 specialty shops are in a state-of-good-repair.

NYC Transit's long-term strategy is to bring the remaining six maintenance and one overhaul shop to a state-of-good-repair by 2009. Normal replacement/rehabilitation investments for major facilities are scheduled at 17-year intervals. Major reconstruction projects are scheduled at approximately the 50-year (mid-life) of facilities.

Rail yards provide secure storage for the revenue and work train fleets when they are not in use, and also support maintenance, repair and cleaning operations. NYC Transit operates 23 yards with 117 miles of track and 1,028 switches. The yards also include a number of other elements such as lighting, security and fire/safety systems. Approximately 78 percent of yard track, 77 percent of yard switches, and 65 percent of yard signal systems are in a state-of-good-repair.

The major thrusts of NYC Transit's 20-year strategy for yards are the annual replacement of approximately three miles of track and 32 switches and the modernization of signal systems at eight yards. In addition, the agency will expand yards to alleviate a shortage and improve the efficiency of train storage facilities. Investments in these and other yard systems will bring all yards elements to a state-of-good-repair by 2015.

- **Bus Depots and Maintenance Facilities**

NYC Transit operates 203 local and 31 express bus routes from 20 bus depots located throughout New York City. Depots are needed to collect revenue from buses, clean and fuel them in preparation for service, perform routine maintenance and light repairs, and store buses when they are not in operation. In addition, NYC Transit currently operates one central maintenance facility at East New York in Brooklyn and six smaller shops throughout the city to provide heavy or specialized repairs. These facilities also house bus painting and washing facilities, as well as communication systems. With the investments made through 1999, 18 of the 20 depots have reached a state-of-good-repair. Two depots are currently closed and being reconstructed and a new central maintenance facility will be constructed in the Bronx.

Like its bus purchases, NYC Transit's long-term plan for depots also builds on the agency's 1993 bus fleet and facility strategy. A major goal is to add bus maintenance capacity with new or expanded facilities to meet growing operating and storage requirements. This includes having central maintenance facilities sized and equipped to efficiently handle the needs of the growing and diverse bus fleet. In the process, NYC Transit will consolidate several smaller facilities to improve efficiency. Another goal is to modify facilities to handle a diversified fleet of articulated buses, high capacity express buses, and clean fuel buses including CNG and electric-hybrid buses.

Increases in the size of NYC Transit's bus fleet have resulted in capacity shortfalls at some depots and maintenance shops. The plan calls for adding a second central maintenance facility and a depot in Brooklyn/Queens and expanding other depots, including converting the old central maintenance facility in Brooklyn for use as a depot. These investments and rehabilitation or reconstruction of several existing depots will bring all facilities to a state-of-good-repair by 2005. When reconstruction or rehabilitation of other depots is completed, the Hudson and Amsterdam depots are planned to be closed. Once a depot achieves a state-of-good-repair, normal replacement investments begin every 17 years and major reconstruction every 50 years. New communications and vehicle locator systems also will be introduced following evaluation of a system now being pilot tested.

- **Service Vehicles**

NYC Transit operates specialized work trains and rubber-tire vehicles to support capital construction and maintenance operations. The work train fleet has 440 vehicles including diesel locomotives, refuse cars, hopper cars, rail grinders, snow throwers, track geometry cars, crane cars, flat cars, and other miscellaneous vehicles. The rubber-tire vehicle fleet has 417 capital vehicles including armored trucks, salt spreaders, tow-trucks, vans, mobile station washer trucks and other vehicles for a variety of functions. The rubber-tire fleet also has many smaller, less specialized vehicles that are replaced on a more frequent basis through the agency's operating budget.

The service vehicle fleets have been in a state-of-good-repair since 1987. NYC Transit's investment strategy focuses on continuing the normal replacement of

various vehicle groups base on operating needs. Among the elements included in the plan are an increase in the number of trucks for revenue collection and the conversion of retired passenger cars to replace existing work trains.

- **Security**

NYC Transit's passenger security program includes initiatives to provide riders with a secure environment. The Transit Bureau of the New York Police Department (NYPD), formerly the New York City Transit Police, operates out of 18 district offices and other facilities. In accordance with the merger agreement between NYC Transit and the City of New York, NYC Transit will continue to consider specific capital needs of the Transit Bureau related to these facilities. Eleven of the facilities are in a state-of-good-repair. NYC Transit's long-term strategy will complete state-of-good-repair investments for all locations by 2007. These facilities will be rehabilitated and upgraded to effectively support modern police operations.

- **Miscellaneous**

This category has varied investments to support the work of the capital program. They include safety and environmental improvements, such as asbestos abatement, upgrade and replacement of fire safety systems, and installation of backflow preventers in various facilities. Employee facilities also are included here; NYCT is rehabilitating and, where possible, consolidating them. NYCT utilizes consultants for specialized engineering services to support ongoing and planned capital work.

Such services include land borings, concrete testing, environmental analysis, value engineering and other architectural and engineering support.

- **Staten Island Railway**

The Staten Island Rapid Transit Operating Authority was created in 1971 when the City of New York purchased the railroad from the Baltimore and Ohio Railroad Company. Now known as the Staten Island Railway (SIR), its 64-car fleet operates over a 14.3 mile line with 22 passenger stations between Tottenville and the St. George Terminal, where most customers transfer to and from ferry boats. Because nearly all SIR assets are in a state-of-good-repair, normal replacement investments predominate the twenty-year period. These feature replacement of SIR's fleet when the cars reach the end of their useful life. In addition, SIR's power needs will be assessed to assure the availability of traction power.

Long Island Rail Road Capital Needs 2000-2019

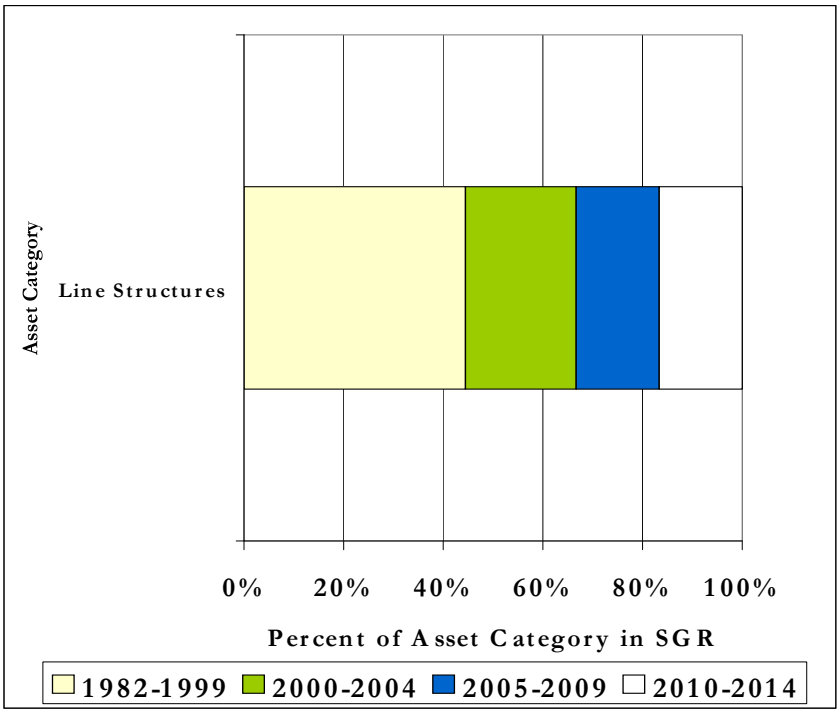
Long Island Rail Road's long-term vision focuses on maintaining the existing infrastructure in a state-of-good-repair, expanding service to support transportation demands on Long Island, introducing new technologies to optimize operations and safety, and supporting regional system expansions.

Long Island Rail Road forecasts investments totaling $8 billion through 2019 (Table 3). This proposed level of investment, developed through an extensive, integrated staff effort, will continue the replacement of life-expired assets and ensure that line structures, the only asset category currently not in a state-of-good-repair, will be brought into a state-of-good-repair in the 2010-2014 timeframe (Chart 3).

Table 3
Long Island Rail Road Summary of Needs 2000-2019
(1999$ in millions)

Investment Category	2000-04	2005-09	2010-14	2015-19	Total
Rolling Stock	$990	$868	$0	$481	$2,339
Stations	303	195	185	173	855
Track	291	490	575	332	1,688
Line Structures	158	52	52	52	314
Communications and Signals	180	408	267	287	1,142
Shops and Yards	50	518	54	83	705
Power	42	68	282	30	423
Miscellaneous	5	12	12	12	41
Total	**$2,017**	**$2,611**	**$1,427**	**$1,450**	**$7,505**

Chart 3
Progress to State-of-Good-Repair for Remaining LIRR Investment Categories



Asset Category Summaries

- **Rolling Stock**

Presently, the Long Island Rail Road rolling stock fleet consists of 914 electric cars and 134 locomotive hauled diesel coaches. This includes 23 diesel electric locomotives and 23 dual mode locomotives that can operate in electric territory, initiating one-seat ride service into Penn Station from diesel branches.

Over the next 20 years, the composition and size of the Long Island Rail Road's electric fleet will change dramatically. The majority of the electric fleet, 742 M-1 cars, will be replaced with new M-7s, with increases in the LIRR's electric fleet to accommodate ridership growth (prior to the implementation of Grand Central Terminal/ESA service), seat loss per car due to ADA compliance and increased spare ratio. The 172 car M-3 fleet will be overhauled extending the useful life of these vehicles. These investments in rolling stock will improve performance and customer satisfaction, accommodate ridership growth, expand service, increase maintainability and reliability, and increase the operating margin. Other potential investments include the expansion of LIRR dual-mode service by converting up to 16 diesel electric locomotives to dual-mode locomotives, expanding one-seat ride service into Penn Station.

- **Stations**

The Long Island Rail Road operates ten line branches and serves customers at 124 stations in Nassau and Suffolk counties and New York City. The long-term objective of investments in this asset category is to improve the appearance and utility of Long Island Rail Road stations thereby increasing the satisfaction of current and future customers. Investments proposed for this category will maintain these assets in a state-of-good-repair and guard against increased maintenance and potentially unsafe conditions. Included in this area is the rehabilitation of station and parking facilities system-wide. Also included are investments to expand parking and construct intermodal station facilities. With the rehabilitation of Jamaica Station, in conjunction with the Port Authority's

Airport Access project, and the construction of a new Atlantic Terminal complex, the LIRR will have upgraded all of its terminals and major stations.

The replacement and expansion of the existing ticket vending machine (TVM) and ticket office machine (TOM) network will provide cost-effective ticket selling capabilities, to improve customer wait times at ticket windows and support the reduction of on-board ticket sales.

Looking to the future, the Long Island Rail Road's train dispatching, communications and signaling features must be updated to correspond to the new fleet. To that end, a new control tower with updated train dispatching will replace the towers east of Jamaica.

- **Track**

The Long Island Rail Road has 701 miles of track rail, all of which are in a state-of-good-repair. The ongoing maintenance of the system includes the replacement of component assets on a life-cycle basis. Included in this category are cyclical normal replacement projects to maintain the track infrastructure (wood ties, rail, track surface and turnouts). The cyclical replacement of track rail components is based on age, condition, and physical inspection. LIRR's long-term strategy in this area also includes the installation of concrete ties in place of wood ties in selected areas to maximize service life and ensure longer periods between track outages, thus minimizing the impact on customers.

Also included are significant system improvements: the construction of a third track on the Main Line between Queens and Divide interlockings and a second Main Line track from Farmingdale to Ronkonkoma that will provide a substantial increase in train capacity. Right-of-way improvements, such as drainage and fencing projects, are expected to continue after 2004. With a useful life span from seven to 12 years, life-expired construction equipment will have to be replaced over the next 20 years.

- **Line Structures**

The Long Island Rail Road's line structures category (bridges and viaducts) is the only asset group not in a state-of-good-repair. Investments planned over the next 20 years will bring the assets in this area into a state-of-good-repair (in the 2010-2014 timeframe) and maintain them under a cyclical normal replacement program. It is also expected that rehabilitation of the East River tunnels (which connect Penn Station to the Queens portion of the Long Island Rail Road system) will continue over the next 20 years, with the participation of Amtrak.

- **Communications and Signals**

Over the next twenty years, the communications and signal infrastructure will be upgraded to increase operational capacity and ensure the provision of cost-effective, safe and reliable rail service. Included in this category is the cyclical normal replacement of the communications and signals infrastructure to maintain past investments and lay the groundwork for improvement and expansion. Planned investments in the communications infrastructure will enable the LIRR to

meet ever-increasing voice, video and data requirements (both vital and non-vital) while increasing reliability and reducing dependence on leased line services. By 2009, the entire communications network will be fiber-optic based. Included is the installation of a fiber optic cable backbone to utilize third party installed fiber along LIRR's right-of-way and a distribution system to update the communications technology and capacity.

The signal system will also be upgraded and modernized to continue the safe operation of trains. While this asset category is in a state-of-good-repair, the railroad has the oldest cab signaling system in the country. The proposed replacement of these systems with modern, state-of-the-art equipment is critical to maintain prior investments and support the new rolling stock fleet. Additionally, new technologies, such as Communications-Based Train Control (CBTC) will result in a reduction of life cycle costs, an increase in line capacity, and enhanced functionality.

- **Shops and Yards**

Currently, the Long Island Rail Road operates 25 shops and yards for fleet storage, maintenance and inspection services. Over the next twenty years, the rolling stock fleet size is expected to grow as much as 30 percent to meet projected ridership growth and additionally for the planned expansion into Grand Central Terminal. Anticipating this growth, the Long Island Rail Road is finalizing a long-term operating and maintenance strategy to identify the optimal mix of existing yard upgrades, expansions and new yards to support service requirements. The rehabilitation and upgrade of facilities at Long Island City and Hillside will

accommodate the maintenance of the new electric and diesel fleets. The rehabilitation of the train wash at Babylon and the construction of a new car wash at Port Jefferson will also support fleet upgrade and expansion. Improvements include new storage facilities at Huntington, Babylon and Yaphank, and expansion of the yards at Ronkonkoma, Port Washington and Hempstead. Also included is the replacement of employee facilities. Finally, the construction of a new locomotive heavy repair and overhaul shop will replace the existing structure which has reached the end of its useful life.

- **Power**

The long-term goal of investments in the power infrastructure is to continue to schedule the component replacements necessary to maintain the power infrastructure, replacing equipment that has reached the end of its useful life and reducing equipment failures. Maintaining these assets ensures the safe operation of trains and contains the growth of operating costs.

Over the next 20 years, approximately one-third of LIRR capital power investments will be in substations. Eight substations are scheduled for reconstruction and twelve will undergo complete equipment replacement. The adequacy of the existing power infrastructure to handle the increased demands of the new M-7 fleet is currently being evaluated. System enhancements may be required over the 20-year period to support this demand. Also included are programs to electrify the Central Branch (bridging the gap between the Main Line and the Montauk Branch) and the Main Line from Ronkonkoma to Yaphank - to

provide greater routing flexibility and meet the growing service needs of developing communities.

- **Miscellaneous**

  Included in this area are investments to maintain a state-of-good-repair in Penn Station and to replace overage construction equipment.

Metro-North Railroad Capital Needs 2000-2019

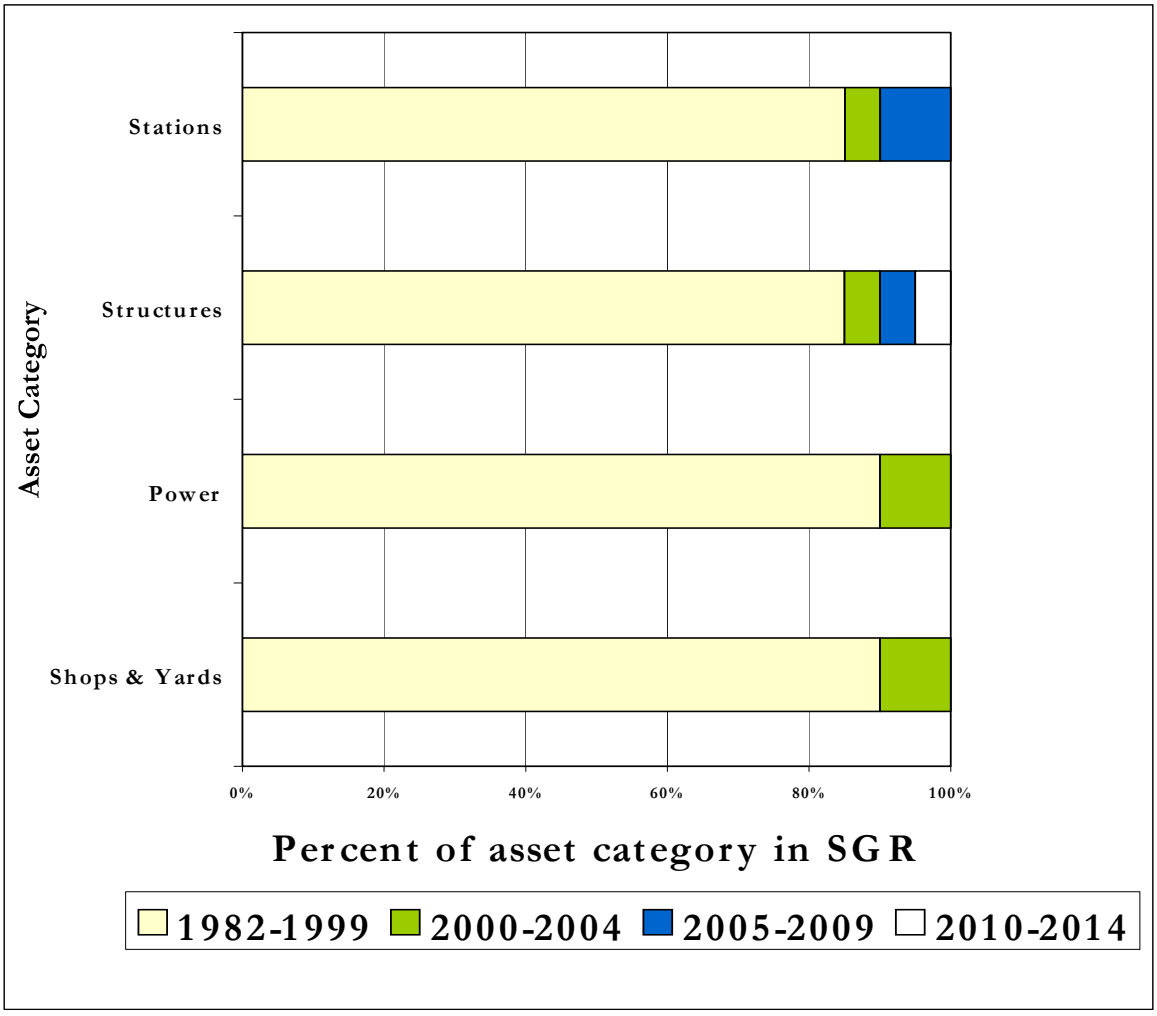
Metro-North's early focus was on large-scale reinvestment in a system in disrepair in order to restore basic infrastructure to reliable condition. Today, with much of that work complete, MNR's focus is shifting to initiatives that protect past investments and provide targeted improvements resulting in increasing ridership.

Metro-North Railroad forecasts investments totaling $7 billion through 2019 (Table 4). This level of investment will ensure that the entire system is brought into a state-of-good-repair by 2014. Shops and yards will achieve a state-of-good-repair by 2004, stations by 2009 and line structures by 2014 (Chart 4).

Table 4
Metro-North Railroad Summary of Needs 2000-2019
(1999$ in millions)

Investment Category	2000-04	2005-09	2010-14	2015-19	Total
Rolling Stock	$513	$940	$463	$483	$2,398
Stations	284	496	698	425	1,903
Track and Structures	204	364	288	245	1,100
Communications and Signals	60	138	124	83	404
Power	33	54	30	31	149
Shops and Yards	134	286	190	140	749
Total	$1,227	$2,278	$1,792	$1,407	$6,704

Chart 4
Progress to State-of-Good-Repair for Remaining MNR Investment Categories



Asset Category Summaries

- **Rolling Stock**

Metro-North Railroad's East of Hudson rolling stock fleet consists of 532 electric cars, 176 diesel coaches (inclusive of Connecticut DOT-owned equipment) and 49 locomotives. In addition, 9 diesel locomotives and 31 coaches are currently

supplied for service West of the Hudson on the Port Jervis and Pascack Valley lines, per an agreement with New Jersey Transit.

In the short term, Metro-North Railroad will replace and expand its overage M-1 series electric car fleet. Investments will also be made to replace and expand the fleet of diesel coaches and locomotives both east and west of the Hudson. The long-term goal for investments in this area is to move toward a more balanced fleet between electric cars and dual-mode locomotive hauled trains on the Harlem and Hudson lines. This balanced fleet provides operational flexibility and allows for the use of diesel coach consists in electric territory. In addition, investments will be made to replace and/or upgrade the Metro-North and Connecticut Department of Transportation fleet of New Haven line electric cars which will be approaching the end of its useful life during this period.

Capital investment in the Metro-North Railroad West of Hudson fleet are also necessary to improve service and meet projected ridership growth due to such initiatives as the new Secaucus Transfer Station, to be completed in 2002.

- **Stations**

There are 72 Metro-North Railroad passenger stations in New York State east-of-the-Hudson, and two will be added by the end of 2000. Twelve more stations are located in the railroad's territory west-of-the-Hudson. The long-term objective of station and parking rehabilitations is to achieve a state-of-good-repair by 2009, improve operations, and increase customer satisfaction. Included are rehabilitation and expansion investments for elements in Grand Central Terminal that will

enhance operations and continue to rehabilitate the trainshed. Funds are allocated to improvements at outlying stations on all branch lines, including parking facility improvements and repairs.

In addition, over the next twenty years, Metro-North will make progress toward constructing new station facilities to accommodate increased ridership, particularly on the Upper Harlem line, and construct a new Yankee Stadium station in the Bronx once the lease discussion between the City of New York and the Yankees is complete. Furthermore, opportunities to construct regional stations will be explored to increase access and parking availability.

- **Track and Structures**

There are 338 route miles and 729 track miles that constitute the Metro-North Railroad system in New York State and Connecticut. Of that amount, 455 miles are electrified. The long-term objective of investments in this area is to maintain the condition of the existing assets and achieve a state-of-good-repair (for undergrade bridges) by 2014. The ongoing rehabilitation of the trackage is essential to providing customers with a safe, reliable, and comfortable ride. To accomplish this, Metro-North has developed a cyclical program of track and turnout rehabilitation and replacement that maintains track structure components and switch facilities in proper operating condition without safety hazards or speed restrictions. Similarly, the continued integrity of line structures along the railroad right-of-way is vital to its smooth and safe operation. This includes overhead and undergrade bridges, viaducts, tunnels, and retaining walls.

- **Communications and Signals**

  The primary long-term objective of investments in this category is to consolidate all Metro-North Railroad communications lines for essential train operations and information system uses into one fiber optic network. The result will be a comprehensive and fully redundant network designed to accommodate all of the railroad's communications requirements, from signaling and operational information transmission to one network for office telephone and computing needs.

  In addition, MNR looks to optimize train capacity to accommodate the railroad's current needs, future service plans and future ridership projections. To that end, funds will be allocated to improve signalization and block respacing and will maximize and improve track capacity, where appropriate.

- **Power**

  The long-term objective of investments in this area is to maintain the condition of the existing assets and improve substation (third rail power) capacity, to support current train capacity and increased needs projected over the next twenty years. Investments in this category may include the construction of additional DC substations.

- **Shops and Yards**

  Currently, Metro-North Railroad operates 11 shops and yards for fleet storage, maintenance and inspection services. MNR's long-term strategy is to upgrade and adequately size these facilities to accommodate additions to the rolling stock fleet, improve maintenance and on-time performance, and ensure customers the highest quality of service. In support of the long-term strategy, MNR will replace and upgrade its Croton-Harmon shop and yard infrastructure, to meet the demands of the current (and planned) fleet, and support maintenance practices. Improvement and expansion of other shops, including Port Jervis Yard, Highbridge Yard and Brewster North, will also support the new fleets.

Network Expansion

Summary

The regional economy is growing, creating increasing demands on the transportation network (particularly the commuter rail and subway system) to provide access to employment sites for the region's labor force. Economic forecasts point to continued growth potential over the next twenty years. To facilitate this growth, renewal of the MTA's infrastructure must be accompanied by network expansion. Today, and in the future, there are significant needs to:

- Relieve overcrowding;
- Reduce longer travel times; and
- Increase accessibility to key economic centers.

Some of these needs are already being addressed. In fact, beginning in 2001, New York City Transit will link its 63rd Street tunnel to the Queens Boulevard subway line, providing an additional 12 trains per hour from Queens to reach Manhattan in the peak travel period. On the commuter rail system, a 5 mile extension of the Metro-North Railroad Harlem line into Dutchess County is under construction to address a fast-growing area of the railroad's service area.

Yet, much more needs to be done. Of particular importance to the regional economy is improved access to the Manhattan Central Business District, the area from 59th

Street to the Battery. The strategic importance of the Manhattan core is best understood through the following factors:

- Over one million jobs are located in Midtown alone.
- Over ½ of all national earnings in securities and commodities are generated in Manhattan.
- A full 1/3 of all the assets of top 100 US bank holding companies reside in Manhattan.
- 1/3 of all US service exports emanate from Manhattan. The service industry has been the fastest growing sector of the national economy.[7]

The key transit links between Manhattan and the surrounding metropolitan region are under stress today as travel demand has grown, while the capacity and connectivity of the rail network has remained relatively unchanged. Growth in the future will only make conditions in the transit network worse. The configuration of the MTA rail network must be enhanced in these key areas.

Master Links, The Vision

In 1997, recognizing the importance of modifying the transit system to meet future economic needs, Governor Pataki introduced "Master Links", a vision to better integrate and expand the existing rail network.

Master Links aims to better integrate and expand the existing rail network in order to enhance travel from the region to and through Midtown and Lower Manhattan, the economic engines of the region and, for certain key industries, the nation.

Broadly, the Master Links vision seeks to:

- Create a stronger economy.
- Make New York more competitive nationally and in the global marketplace.
- Cut down on congestion and pollution.

Master Links will achieve these goals by:

- Overall, improving mass transit in New York, building on the tremendous gains made to date in renewing the existing network.
- Making trips to work faster and more reliable.
- Linking New Yorkers with employment opportunities by providing new and more efficient transit alternatives to driving.
- Making trips to the region's airports faster and more reliable.

The Master Links vision and goals have resulted in the identification of several critical travel issues and a series of specific network expansion projects which address these issues. The following sections describe these mobility problems and projects.

Critical Travel Issues

Queens and Suburban Long Island-Manhattan

Every day, the Long Island Rail Road (LIRR) plays an essential role in the region's ability to retain and attract businesses and residents by linking Queens, Nassau and Suffolk County labor force with jobs in Manhattan. The LIRR is the busiest commuter railroad in the country and carried over 82.2 million riders in 1999.

Today, and in the future, travelers from Eastern Queens and Long Island will face significant problems:

- Penn Station is no longer the destination of choice for over half of LIRR customers. Since World War II, 88 percent of the office space (as measured by square footage) built in Midtown Manhattan has been in East Midtown within walking distance of Grand Central Terminal. Today however, the LIRR does not provide direct service to East Midtown Manhattan, a major concentration of jobs and the destination of 53 percent of its current riders. Consequently, 47,000 LIRR customers must transfer to another mode to reach their final destination in East Midtown - adding from 15-30 minutes per journey.

- Further, Penn Station, the LIRR's only Manhattan terminal, has inadequate capacity. It shares the terminal with Amtrak (the owner) and New Jersey Transit. And, while providing over 70 percent of the daily train service, it has less than 45 percent of the track and platform space. About 87 percent of morning peak LIRR westbound passenger trips terminate in Penn Station. During the morning peak

hour, the station operates near capacity, with trains arriving at the rate of 37 trains per hour, the equivalent of one 12-car train arriving every 100 seconds.

- Both suburban Long Island and Queens riders need additional commuter rail capacity. By the year 2020, Nassau and Suffolk counties are expected to generate 36,000 more daily journey-to-work trips to Manhattan than in 1990 and Queens could generate up to an additional 62,000 daily trips. However, due to current terminal capacity limitations, more frequent LIRR service to Eastern Queens stations (e.g. Queens Village) and suburban Long Island is not possible. Without new capacity, morning peak hour passenger volumes between Jamaica, Queens and Penn Station are projected to exceed 127 percent of capacity by the year 2020.

Manhattan East Side

Manhattan's East Side is densely developed with residential, retail, and commercial office uses, and includes the largest central business district (CBD) in the nation, Midtown Manhattan. With nearly 700,000 residents and some 1.2 million jobs at the core of the greater metropolitan area, the East Side plays a key role in the overall travel patterns throughout the region[8]. Lower Manhattan (south of Chambers Street) is the nation's third largest CBD with over 120 million square feet of office space[9]. Currently, daily work travel totals over 360,000 persons, with 1/3 coming from the suburbs[10].

Each day, millions of people travel through the east side as they commute to and from work. Most of these trips begin outside the area, but area residents also account for a large number of trips (about 18 percent). Those who work in the area

overwhelmingly make their journey-to-work on public transit: as reported in the 1990 U.S. Census, 78.5 percent use the subway, bus, rail, or ferry to get to and from their jobs during the morning and evening rush hours. In addition to work trips are trips made for other purposes, including shopping, entertainment, and tourism.

As economic growth has occurred however, more stress has been placed on this corridor's only subway link under Lexington Avenue, and on buses operating in local traffic on congested north-south avenues. Today, during the AM peak hour on an average weekday, Lexington Avenue line subway ridership exceeds loading guidelines at key points along the line, which negatively impacts travel time, reliability and overall comfort. In particular, Lexington Avenue express trains are currently experiencing as much as 16 percent above loading guidelines at the lines busiest stations, such as 86th St and 42nd St-Grand Central. These conditions also impact suburban commuters and others traveling to the Financial District who make use of the Lexington Ave line to Lower Manhattan, making their trips difficult and time-consuming. Above ground, the city's streets and highways are congested during peak periods, slowing transit as well.

A glimpse into the future reveals that the East Side will grow as a transportation corridor as Manhattan grows overall. Demographic forecasts project that employment in Manhattan could grow by 14 percent in the next 20 years, while the residential labor force could grow by 11 percent. Total Journey to Work travel to Manhattan is projected to increase by 13 percent, and intra-Manhattan travel by 8 percent. This growth is projected to generate additional ridership on the Lexington Ave subway line, resulting in further peak hour crowding by 2020, if no improvements are made.

Manhattan West Side

As travel on Manhattan's East Side has continued to grow, so to has demand on the West Side (west of 8th Ave). West Side demand is spurred by the current extended period of economic strength in New York City, as well as the success of the Jacob Javits Convention Center. The corridor has capacity for further commercial and residential development. More timely access from eastern and central Midtown and from outer borough and suburban commuter territories could support this growth resurgence. The promise of further development has called for an extension of the regional rail system westward.

Airport Access

Master Links recognizes that travel to New York's airports (JFK and LaGuardia) must be faster and more reliable. Whether New York continues to be a leader of world commerce and finance hinges in part on the quality of the region's airports and on their accessibility. In 1994, the Port Authority estimated that the airports contributed $29 billion annually to the region's economy.[11]

Today however, New York, despite a vast intermodal network of highways, rail lines and bus routes, is virtually the only major city in the world without direct public rail access to its airports. Travel to JFK and LaGuardia is increasingly time consuming and unreliable, due to severe highway congestion, particularly during peak periods. Taxi rides on congested highways are arduous and expensive, and traffic conditions make travel times notoriously unpredictable. Without transit access, and as airport usage increases (2.5 -3 percent a year[12]), conditions will worsen.

The Port Authority Airtrain project is advancing a new link between JFK Airport and the regional transportation system. MTA is working with the Port Authority to make significant improvements at both the Jamaica LIRR/subway station and the Howard Beach subway station. The Airtrain and rail station improvements will yield a link between JFK Airport passenger terminals and Manhattan via a transfer at Jamaica in as little as 45 minutes.

Rail access between Manhattan and LaGuardia Airport has not been achieved. Over 66,000 trips are made to and from LaGuardia Airport each day[13] in conditions that result in travel delays and unreliable service on some of the region's most congested highways.

Priority Projects to Address Critical Transportation Issues

The immediate priority for the next twenty year period is to advance new rail links (commuter rail and subway) that respond to the region's most critical travel needs, as well as address the region's most significant long-standing transportation issues. These priority projects are underway. In summary, they include:

- **LIRR East Side Access**

  MTA is developing a new LIRR connection to Grand Central Terminal to significantly reduce travel times for over half of today's commuters and relieve Penn Station congestion. The project also creates an opportunity for Metro-North

to serve West Midtown and to support airport access with improved service between Manhattan and the JFK Airport Airtrain system.

- **Second Avenue Subway**

  Construction of a full-length Second Avenue subway line from 125th St in East Harlem to the financial District will relieve overcrowding and delays on the Lexington Ave line, and improve access to transit on the East Side of Manhattan and in Lower Manhattan.

- **LaGuardia Airport Access**

  Construction of direct rail access to LaGuardia Airport is needed to address a glaring weakness in the regional transit system. MTA is evaluating rail service alternatives in partnership with the City and State of New York, the Queens Borough President and the Port Authority of New York & New Jersey.

- **Penn Station Access**

  Shifting some LIRR service to GCT as a result of the LIRR East Side Access project will provide the opportunity to offer direct Metro-North service to Penn Station for Mid-Hudson commuters traveling to the West Side of Midtown Manhattan.

- **#7 Line-West Side Access**

  A current land use study by NYC Department of City Planning will contribute to an MTA effort to define ways to improve far West Side access, including new links such as an extension of the #7 line.

In total, up to $20 billion (in 1999 dollars) could be needed over the next twenty years to construct these projects. Key initiatives will be launched during the first five years of this period, 2000-2004.

Other Planning Initiatives

Other long range planning initiatives are being explored which may result in projects for future implementation in the 2000-2019 period:

- **JFK One Seat Ride Access**

  MTA is completing a study of strategies to achieve one-seat rail access from Manhattan to JFK Airport, utilizing the Port Authority of New York & New Jersey's "Airtrain" rail system currently under construction.

- **Beacon Line Corridor**

  A feasibility study is underway by Metro-North Railroad to examine the potential for passenger service in one of the railroad's fastest-growing markets, from

Hopewell Junction (in Dutchess County) to Brewster, White Plains (Westchester County) and New York City.

- **Access to the Region's Core**

  The MTA, New Jersey Transit and the Port Authority of New York & New Jersey are jointly evaluating methods to improve access to the Manhattan CBD, the region's economic core, from Queens and West of Hudson River (NY / NJ) counties.

Footnotes

1 NYS Department of Labor

2 NYMTC Regional Transportation Statistical Report

3 MTA 1998 Annual Report

4 NYMTC Population Forecast 1990-2020

5 NYMTC Employment Forecast 1990-2020

6 NYMTC Journey-to-Work Forecast 1990-2020

7 Access to the Region's Core Study – The Future of the Extended Core in the Regional, National and Global Economies

8 Manhattan East Side Alternatives Study DEIS

9 Lower Manhattan Access Study Scoping Document

10 ibid.

11 Port Authority Airport Access Program DEIS

12 ibid.

13 ibid.